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EDITORIAL

Scholarships and Grants

THERE will always be a number of parents anxious to give their children not only the best scientific education they can afford but an even better one than they can afford. This is rendered possible by the great number and variety of fellowships, scholarships, studentships, and other funds available to assist those who would otherwise be obliged to cut short their academic training before it has been properly completed. Three years at a university were formerly enough to fit a student to enter the academic or industrial world of chemistry; three years no longer suffice; four years or even five are now considered a better period and we are publishing this week a table giving particulars of the post-graduate facilities available for British students. Even with these two qualifications the list is a long one and it almost certainly is uot a complete one. The list has taken some little time to prepare and we must express our gratitude to the many people who have taken the trouble to go through the proofs and make corrections and additions. It will surprise us very much if there are not further corrections and additions to make and we invite our readers to communicate with us at an early date so that in a brief space of time we may have a list worthy of the Society, of the academic profession who may use it, and of chemists in general. It is not clear to us how such a list may be most usefully circulated, and whether it should be revised from time to time and if so how often. Questions of expense have to be considered, but obviously the right thing to do is to make the list as serviceable to chemists as possible. We shall be much obliged to any chemists, whether engaged in teaching or not, who will make suggestions as to how this problem shonld be solved. The names of many great men are preserved by special grants and other grants preserve the names of livery companies or other bodies, whose existence goes back to a time when there was no science of chemistry at all. We should be grateful to those who have so handsomely endowed post-graduate research and should also remember that the State itself is very largely engaged in research or in assisting research in many instances outside the necessarily restricted confines of our list.

Priestley in Paris

The annual meeting of the Chemical Society of France held this year in Paris on June 15—17 has most happily been made the occasion of a French commemoration of the bicentenary of the birth of Priestley, who was a French citizen by a decree of the National Assembly at the time of the Revolution, also one of the eight foreign members of the Academy of Sciences. The French are nothing if not original, so by special invitation the noted international scientific *commis voyageurs* attended the ceremony. Sir William Pope took the chair at the opening meeting held at the Pasteur Institute when Monsieur C. Matignon, professor of chemistry at the Collège de France, delivered with extraordinary *verve* a comprehensive presidential address upon Priestley and his work, carrying the account up to his discovery of oxygen, without further comment. The address is of special value in bringing out more fully perhaps than has been done hitherto Priestley's French associations and sympathies, whilst saying nothing of his relations with Lavoisier. Whatever Lavoisier may have done to establish chemistry as a science he built upon sound and broad foundations largely the work of our English school—Black, Cavendish, and Priestley in particular. It was a surprise to some of the younger French chemists to learn that so great an experimental contribution had been made by Priestley himself. The meeting received the address with great enthusiasm, then went its way, wasting no time upon complimentary votes of thanks. No time had been wasted over formal business previously. The diet set before ns was dainty and was spoilt by no trimmings. A collection of Priestley relics was on view. The meeting is of course a jaunt for country members and their wives, so further proceedings were confined to two afternoon addresses, one by Prof. Böeseken of Delft, on his studies of boric acid derivatives of polyhydric alcohols; the other by Prof. Späth of Vienna, on his recent synthetic studies of alkaloids. On Saturday evening a banquet was given at the Salons George V under peculiarly conducive conditions, both as to charm of surroundings and absence of formality—no toast master, no musical noise to spoil talk, but a perfect *foie gras* as *leit motif.* The gathering was only of moderate size—a family party in fact. Prof. Morgan,

the official delegate of our Society, was able in his speech to pay President Matignon the graceful compliment of announcing his nomination, on the previous Thursday, by the Council of the Chemical Society to the foreign membership.

Metropolitan Water Board

Sir Alexander Houston, the Director of Water Examination, has just issued the 27th Annual Report on the examination of London waters for the year 1932. Owing to financial considerations, the scope of the report has been greatly curtailed; nevertheless it appears to be adequate and many other Government and public reports could be, and are being, reduced for the same reason without much detriment. The chlorination of filtered water, after ammonia treatment to prevent taste troubles, has given excellent bacteriological results and there has also been an enormous improvement in the bacteriological quality of the Thames, Lee, and New River consequent upon storage; the table showing the details of this contains some very striking figures. Section XI is an account of a visit to the Lee Valley Wells, proceeding down the river from Westminster. We are glad that motives of economy did not suggest to Sir Alexander Houston to curtail this very entertaining, human, and unofficial description of London's river, with his quotations from Hans Breitmann, Ann Veronica, The Lure of London, Alphonse Karr, and others. So too in his account of the Lee Valley and the Thames Sir Alexander refreshes us with fragrant bouquets of verse culled from many poets. At the end he says: "Does the writer err in trying to give light and colour to questions of water supply? He thinks not, for if you learn truly to love the Thames and Lee, the main sources of London's water supply, you cannot fail to strive increasingly to preserve the amenities of these beautiful rivers and, as far as this is humanly possible, to protect them from undesirable pollutions. The writer thinks it would be a sad day for the Thames and Lee if the Conservators ceased to add to their great practical knowledge, wide experience, and high abilities the qualities of imagination, love, and romance." Sir Alexander's report is not only poetical; it is a statistical summary of a year's progress on the purification of the drinking water of the Metropolis and that is also well worth reading. We look forward to Sir Alexander's next report, and if he wants an editor to accompany him on a trip up or down the Thames we can recommend someone of whom we have a high opinion, as likely to enjoy the experience and to take an interest in the scientific methods of the Board.

Protein

We have progressed far since the time when the nitrogenous constituents of animals and plants were all considered to be composed of one and the same basic organic substance for which Mulder about a century ago found the appropriate name protein from a Greek word meaning "To be the first." The chemist has been able to take the proteins to pieces, to characterize these pieces, and to establish their structure by synthesis and even to join several of them together again to make complex substances which come within the rang hydrolytic activity of some of the pancreatic ferm and therefore might be considered as very simple teins. He can no longer postulate one protein, ra is he forced to contemplate the existence of an enorm number of different proteins which differ from another either quantitatively, in the relative numbe molecules of the different amino acids which go to t make-up, or stereochemically in regard to the o in which these amino acids are arranged in a long ch Since a molecular weight of 16,000 corresponds t formula such as $C_{726}\ H_{1174}\ O_{214}\ N_{124}\ S_3$, and it is belie that the molecular weight of the proteins is at l 34,000, it will be obvious how complex the molecul and how much in regard to its make-up there is elucidate. There are some twenty well-known an acids discovered at various dates since 1820 w Bracconnot found glycine, though most of our knowle really dates from 1900 when Emil Fischer began to w on them in his new laboratory in Berlin. There undoubtedly other amino acids still to be found as analyses of the proteins account for more than sixty cent Proteins may be differentiated as complete w all the amino acids are present, incomplete when or more of these are absent, disproportionate when s one or more acids are present in large proportions others in very small amounts. It is such differer that explain the different food value of proteins fo has been established that a certain few amino acids indispensable whilst others are not necessary for The time has perhaps come for the chemist to carry a stage further to satisfy our curiosity; for example to the difference between the proteins of beef and mutt eggs and milk. It is true that a beginning has b made along standard lines by feeding varying quanti of proteins in an otherwise complete diet to find minimum amount required to give normal growth; since the function of digestion is to convert the prot into amino acids which are the actual substar assimilated, it is obviously the presence of these rat than the structure of the proteins which is of mom except in so far as the structure and composition of protein makes it resistant to digestion by the tryp enzymes. It is when we come to all those questi embraced by the term "anaphylaxis" that the ex stereochemical structure of the protein really is importance; but this is too abstract a subject for now. Insulin appears to be a protein with consta much the same as those of egg albumin; it has a mo cular weight of 35,100 and its valuable physiologi activity may be a property of some special gro within it. Side by side with the progress in the knowle of the proteins from the point of view of their structu there has been a much greater advance in relation to th physical behaviour, particularly as colloid substanc owing to their importance in industry. Here th properties are applied to many ends, some of them great ingenuity, whilst their structure is of little mome It is because we feel that the analytical side of prot chemistry has been rather neglected and that a mo extensive knowledge of their constitution will lead progress that we have ventured to stress some of t aspects we have chosen.

POST-GRADUATE SCHOLARSHIPS

There was never a time when greater opportunities for higher education and research were presented to candidates possessing qualifications adequate for their proper use. The primary schools are free to all, scholarships available at secondary schools and at the universities abound, and for the graduate the provision made is not meagre, although—such is the intimate connexion between training and practice in scientific research and the future state of industry—many would gladly see it increased out of all recognition.

The Fellowships, Scholarships, and Exhibitions awarded for post-graduate research in pure and applied chemistry range from the Smithson and Sorby Fellowships awarded only to chemists of the highest standing, to modest grants of fifty pounds given to help a graduate to obtain a higher degree.

Some are tenable at home, others only at a foreign university; some leave the candidate free to choose the subject of his research, others limit his investigation to a specified branch of the science; some are of general interest, others have been founded in memory of a particular individual and are awarded only to local inhabitants or graduates of the local university. But it is one thing to know all this and quite another to lay hands, at the right moment, on precise information relating to the individual awards.

An attempt has been made in the accompanying tables to collect and classify, for the information of both teachers and students, as many of these awards as possible. Table I contains those for which any graduate may apply, provided that he has the necessary qualifications and is not outside a possible age limit. They have been annotated (A) those of general interest, (B) those tenable only at a foreign university, usually in the U.S.A., and (C) those where the choice of subject is limited to a definite class of problems. Table II contains awards of more restricted (sometimes purely local) interest, and in some cases the award is not restricted to chemists only but may be available to a graduate in any branch of knowledge.

Holders of awards and authorities responsible for their administration may detect errors in the list; certainly they will detect some omissions. To both—in the interest of the advance of chemistry and chemical industry—a request is made, namely, that they will send any such information to the Editor as soon as possible, in order that a supplementary list may be published without delay.

TABLE I

	Title	Value per ann.	Duration	Conditions and Objects of Award	Date of Application A Election E	Address
A	Smithson Research Fellowship of Natural Science (1)	£800	4—8 yrs.	British subject < 35 yrs. Research in Natural Science at Cambridge University	—	Applications invited by public advertisement. Secretary, Royal Society
A	Sorby Research Fellowship (1)	£500	5 yrs.	Awarded for original scientific research at the University of Sheffield	—	do
A	Senior Studentships (5) 1851 Exhibition	£400	2 (3) yrs.	Age limit 30. Awarded for original research in pure and applied science	A. May 1 E. June 7—15	Awarded by the Commissioners 1851 Exhibition
B	Commonwealth Fund Fellowships (30)	£600	(2 (3) yrs.	Age limit 30. Graduates of British University and of British descent. Awarded for original work (including science) in an American University	A. Feb. 18 E. May	Application made through University or College Authorities
B	Henry Fellowships (4)	£500	1 yr.	Awarded to distinguished graduates for study at Harvard or Yale	A. Dec. 31	The Secretary, Henry Fund, c/o University Chest, Oxford
B	The Robert Blair Fellowships (2)	£450	1 yr.	British subjects (over 21 yrs.). Awarded for advanced study or research in applied science or technology in a foreign University	A. June 1 E. July	The Education Officer, L.C.C.
C	The Ironmongers' Company Research Fellowship (1)	£500	—	Awarded for research on the cold working of steel and other ferrous metals	—	Sheffield University
A	Beit Fellowship for Scientific Research (3)	£250	2 yrs.	Age limit 25. Graduates of European descent. Awarded for training in the methods of scientific research at the I.C.S.T., London	A. Apl. 15 E. July 15	The Rector, The Imperial College of Science and Technology, S.W.7.

A. Grants of general interest.
B. Grants tenable only at a foreign university.
C. Grants awarded for research in special subjects.

	Title	Value per ann.	Duration	Conditions and Objects of Award	Date of Application A Election E	Address
A	Mackinnon (1) and Moseley (2) Research Studentships	£350	2–5 yrs.	*No age limit. Awarded for experimental research in natural science*	—	*Applications invited by public advertisement. Awarded by the Royal Society*
A	Ramsay Memorial Fellowship for Chemical Research (1)	£250	2 (3) yrs.	No age limit or nationality clause. Awarded to graduate of British Empire University for original research in pure or applied chemistry	A. June 5 E. July	The Secretary, Ramsay Memorial Trust, University College, London
A	The Keddey Fletcher-Warr Studentship	£200	3 yrs.	Graduate of British (preferably London) University. Awarded for scientific research	—	The Academic Registrar, London University
A	Pedler Research Scholarship	£300	1 yr.	F.I.C. or A.I.C. to work on a problem of public interest suggested by the Council of the Institute of Chemistry	—	The Registrar, The Institute of Chemistry
A	Scientific and Industrial Research Senior Research Awards (5)	£270—300	3 yrs.	Age limit 27 (British subjects). Awarded to young investigators of exceptional promise for scientific research	A. May 15	Department of Scientific and Industrial Research
A	*The Salters' Company* Fellowship (3—5)	£250—300	—	No age limit. Awarded for specialized training of chemists for industrial careers	A. May 1 E. July	The Salters' Institute of Industrial Chemistry, St. Swithin's Lane, E.C.4.
C	The Gas Light & Coke Company and Radiation, Ltd., Research Fellowships (2)	£175—200	1 (2) yrs.	British graduate; for research on the carbonization of coal, gaseous fuels, and combustion, etc.	E. July	The Registrar, Imperial College of Science and Technology, S.W.7.
C	The Armourers and Brasiers' Company Senior Bursaries	£140—170	—	British (hons.) graduate under 24; *to continue training in* engineering or metallurgy	A. Sept. 15	The Clerk, The Armourers *and Brasiers' Company*, Armourers' Hall, Coleman Street, E.C.2
A	*Agricultural Research* Scholarships	£200	3 yrs.	Awarded to a British hons. graduate in science for agricultural research	A. June 15	The *Ministry of* Agriculture and Fisheries, Whitehall Place, London, S.W.1.
B	Studentships for Research in Animal Health	£300	3 yrs.	Awarded to a British hons. graduate in science (or persons holding veterinary or medical qualifications)	A. June 15	do.
A	The Musgrave Research Studentship (1)	£200	—	Awarded to a graduate of a British Empire University for research in chemistry etc.	A. June 15	Queen's University, Belfast
A	The Berry Scholarship	£160	2 yrs.	Awarded to an honours graduate for research in any subject (including chemistry)	—	The University, St. Andrews
C	Huntley & Palmer Agricultural Research Fund	—	—	Awarded to a post-graduate student for agricultural research	—	The Registrar, The University, Reading
C	Beilby Memorial Awards	£105—200	—	Awarded for distinguished scientific work relating to the special interests of the late Sir Geo. Beilby	June 1	The Registrar, The Institute of Chemistry
C	*Armourers and Brasiers'* Research Fellowship in Metallurgy (1)	£500	2—5 yrs.	*No age limit. Awarded for* research in metallurgy and kindred sciences	—	*Applications invited by* public advertisement. Awarded by Royal Society and Armourers and Brasiers' Company
B	Rockefeller Fellowships in the Natural Sciences	$1,800	1 yr.	For graduates who have demonstrated their capacity for original research and may be expected to produce important work. Candidates do not apply directly but requests for information should be addressed to the European office of the Foundation	Any time	Rockefeller Foundation, European Office, 20 rue de la Baume, Paris

	Title	Value per ann.	Duration	Conditions and Objects of Award	Date of Application A Election E	Address
C	The Andrew Carnegie Research Fund	£100	—	Awarded for research on metallurgy of iron and steel	—	The Secretary, The Iron and Steel Institute, 28, Victoria Street, S.W.1
A	Industrial Bursaries 1851 Exhibition	£143 (maximum)	1, 2 (3) yrs.	Candidates under 25 yrs. taking up engineering, chemical, or other industrial work	E. July	The Secretary to the Commissioners, 1, Lowther Gardens, S.W.7.
A	The Dixon Fund	£275 in all		To assist one or more scientific investigations	A. May 15	The Academic Registrar, London University
B.C	The Arthur S. Dwight Fund	£210	—	For graduates in metallurgy to visit plants in U.S.A.	—	The Institute of Mining Engineers, Cleveland House, 210, City Road, London, E.C.1
C	The College of Technology (Manchester) Research Scholarships in Technology (10)	£100	—	Given to Empire graduate for research in technology	—	The Registrar, Manchester University
C	Sheffield University Scholarship in Glass Technology	£175—200	1 (2) yrs.	Awarded to an honours graduate for research in glass technology	—	The Registrar, Sheffield University.
C	Brotherton Research Scholarship	£100	1 (2) yrs.	Awarded for research in industrial chemistry	A. May 31	The Registrar, Leeds University
C	Clothworkers' Research Fellowships and Scholarships	£100—160	1 yr. (renewable)	Awarded for research in (*a*) subjects connected with the textile industries, or (*b*) colour chemistry and dyeing	A. June 1	The Clerk to the Senate, Leeds University
C	Gas Research Fellowship	£200	1 (2) yrs.	Awarded for research on subjects connected with chemistry of gases and combustion	E. June	do.
C	James Edmondson Ackroyd Fellowship	£150	3 yrs.	Awarded for research on subjects bearing upon the production of wool, silk, or other textile materials, or the manufacture of textile fabrics	A. May 1	do.
A	Leverhulme Research Fellowships	£12,000 in all	2 yrs.	To assist experienced workers in (preferably) subjects in which existing provision is inadequate	E. July	The Sec., Leverhulme Fellowship Scheme, Union House, St. Martin's le Grand, London, E.C.1
A	The *Harrison* Memorial Prize	£150	—	Awarded to encourage a young research worker who has shown exceptional ability	—	The *Assist. Sec.*, The Chemical Soc., Burlington House, Piccadilly, W.1

TABLE II

Title	Value per ann.	Duration	Conditions and Objects of Award	Date of Application A Election E	Address
The Carnegie Trust for the Universities of Scotland		2 (3) yrs.	Awarded to a graduate of a Scottish University for original research	A. March 15	The Carnegie Trust, Merchants' Hall, 22, Hanover Street, Edinburgh
Fellowships	£250				
Scholarships	£150—175				
Science Research Scholarships to Overseas Universities, 1851 Exhibition	£250	2 (3) yrs.	Science graduate (under 26) of certain overseas universities. Scholarship not tenable in the Dominion where the candidate has studied	A. May and June E. July	Secretary to the 1851 Commissioners, 1, Lowther Gardens, S.W.7
Priestley Scholarships (two), Birmingham University	£95	—	Candidate must have spent 3 years in a University, preferably Birmingham	—	The Registrar, Birmingham University

Title	Value per ann.	Duration	Conditions and Objects of Award	Date of Application A Election E	Address
The Strathcona Research Studentship (St. John's College, Cambridge)	£200	1 (2) yrs.	Graduate of any University. Preferably member of St. John's College for research in any branch of study (including chemistry)	—	The Senior Tutor, St John's College, Cambridge
Resident Studentship Trinity College, Cambridge	£300 (about)	During Ph.D. course	Graduate not yet in residence in Trinity College	A. July 1	The Senior Tutor, Trinity College, Cambridge
The Goldsmiths' Company Senior Studentship	£250	1 (2) yrs.	Candidate must have an Oxford or Cambridge qualification. Awarded to assist post-graduate studies	A. May 24	The Clerk, Goldsmiths Hall, London, E.C.2.
The Matheson Residential Scholarship (St. Andrews)	£100	—	Awarded every second year	—	The Registrar, St. Andrew's University
The John Winthorp Hachell Prize.	£100	1 yr.	Awarded to an honours graduate undertaking research in science	—	Trinity College, Dublin
Irish Free State, Department of Technical Instruction	£100	—	Awarded to graduates of Irish Universities undertaking scientific or industrial research	—	The Department of Technical Instruction, Irish Free State
The Johnston Chemistry Scholarship (Armstrong College)	£150	1 yr.	Awarded by examination ..	—	The Principal, Armstrong College, Newcastle-on Tyne
Sir Clement Royds Memorial Scholarship	£300	1 yr.	Restricted to natives or inhabitants of Lancashire	A. June 1	The Registrar, Manchester University
The Alfred Capper Pass Scholarship, Bristol University	£52	1 (2) yrs.	Awarded to an honours graduate for research in metallurgy	—	The Registrar, Bristol University
Trinity College (Dublin) Prizes	£50	—	Awarded on the honours degree examination to Dublin graduates for post-graduate research	—	Trinity College, Dublin
Reading University Senior Scholarship	£80—100	1 (2) yrs.	Awarded to Reading graduates with good honours degree for post-graduate research	—	The Registrar, Reading University
Ernest Ridley Research Scholarship	£50 + fees	1 (2) yrs.	do do	—	do
Huntley & Palmer Agricultural Reserve Fund	—	—	Awarded to post-graduate students for agricultural research	—	do
The Baxter Scholarship in Physical Science	£135	2 yrs.	Restricted to Edinburgh graduates	—	The Registrar, Edinburgh University
The Vans Dunlop Scholarship in Chemistry	£100	3 yrs.	do do	—	do
The Campbell Brown Fellowship, Liverpool University	£150	2 yrs.	Awarded on the honours degree examination for chemical research	—	The Registrar, Liverpool University
The Sheridan Muspratt Chemistry Scholarship (Liverpool University)	£50	2 yrs.	Awarded by examination for chemical research	—	do
Research Scholarship, Liverpool University	£50	1 yr.	Awarded to a Liverpool graduate for chemical research	—	do
The United Alkali Company's Post-Graduate Scholarship in Chemical Research	£125	1 (2) yrs.	Awarded on the honours degree examination (Liverpool University) for chemical research	—	do
The John Willox Scholarship, Liverpool University	£50	2 yrs.	do do		do
The Frederick Clifford Scholarship, Sheffield University	£50	2 yrs.	Awarded to graduates of Sheffield University	—	The Registrar, Sheffield University
The E. N. Linley Scholarship, Sheffield University	£75	1 yr.	Do. for research in chemistry or metallurgy	—	do
Sheffield Mechanics Institute Scholarship	£50	1 (2) yrs.	Awarded to local candidates for research	—	do
The Robert Styring Scholarship	£100	1—4 yrs.	Awarded to local candidates for research or metals	—	do

Title	Value per Ann.	Duration	Conditions and Objects of Award	Date of Application A Election E	Address
The Alfred Tongue Scholarship	£100	1 yr.	Awarded to Sheffield University graduate intending to follow an industrial career, for research in engineering, chemistry, or metallurgy	—	The Registrar, Sheffield University
The George Senior Fellowship	£125	1 yr.	Awarded to a British graduate of Sheffield University for research in metallurgy	—	do
Sheffield Town Trustees Fellowship	£75	1 yr.	Awarded to a Sheffield graduate for research	—	do
The Ironmongers' Company Research Scholarships (2)	£150	1—4 yrs.	Awarded for research in metallurgy and the cold working of steel and ferrous metals	—	The Registrar, Sheffield University
The Pemberton Fellowship	£120	2 yrs.	Awarded to honours graduate of the University of Durham for post-graduate research	E. July	The Secretary, Council of Durham Colleges, 38, North Bailey, Durham
The County Council of Durham, Senior (Research) Exhibitions (2)	£150	1 (2) yrs.	Awarded to residents in the county area of Durham, age 18–25, for research in subjects which bear upon the industries of Durham	July 31	The Director of Education, Shire Hall, Durham
The Andrews Studentship	£73	2 yrs.	Awarded by examination to a student of Queen's College, Belfast	—	Queen's University, Belfast
The Dunville Studentship	£75 (average)	2 yrs.	do do	—	do
Queen's University (Belfast) Science Studentships	£50	1 yr.	do do	—	do
The John Gray Jubilee Scholarship	£65	1 yr.	Awarded to a University graduate, preferably to the son of a member of the Society of Chemical Industry of 10 years' standing	June 30	The Gen. Secretary, The Society of Chemical Industry, 46, Finsbury Square, E.C.2
University Fellowships and Scholarships	£75—150	1 (2) yrs.	Awarded to Leeds graduates for post-graduate research	E. June	The Clerk to the Senate, Leeds University
Sir Swire Smith Fellowship	£150	2 yrs.	Awarded to Leeds graduates for post-graduate research	E. June	do.
Arthur Smithells Scholarship	£100	1 (2) yrs.	Awarded to Leeds graduates for research on the phenomena of combustion, in the widest sense	A. June 1	do.
Richard Reynolds Scholarship	£100	1 (2) yrs.	Awarded to Leeds graduates for research in chemistry or pharmacy	A. June 1	do.
West Riding Research Fund	£500 in all	1 (2) yrs.	Grants to Leeds graduates for post-graduate research	A. June 1	do.
Neil Arnott Studentship in Chemistry	£100	1 yr.	Awarded on the results of the Final B.Sc. Exam., London University	—	The Registrar, London University
University Post-graduate Studentships	£150	1 (or 2) yrs.	Graduates of University of London, under 25	A. May 1	The Principal, University of London
University Post-graduate Travelling Studentships	£275	1 yr.	Graduates of University of London, under 28	A. May 1	do.

PRODUCTION OF HIGHER ALCOHOLS, ALDEHYDES, AND KETONES

By GILBERT T. MORGAN and DOUGLAS V. N. HARDY

The results of our studies of the modified methanol synthesis (Morgan, Hardy, and Proctor, J.S.C.I., 1932, **51**, 1 T) are in harmony with the aldol theory, which postulates the formation of higher alcohols and aldehydes from lower aldehydes by successive processes of aldolization, dehydration, and hydrogenation :

$$\mathrm{R{\cdot}CHO + R'CH_2{\cdot}CHO \longrightarrow RCH(OH){\cdot}CHR'{\cdot}CHO \rightarrow RCH{:}CR'{\cdot}CHO \longrightarrow RCH_2{\cdot}CHR'{\cdot}CHO \longrightarrow RCH_2{\cdot}CHR'{\cdot}CH_2OH}$$

A corollary of this theory is that every aldehyde may either aldolize or undergo hydrogenation, or react in both these ways. Consequently the more complex alcohols might be expected to occur in smaller proportions. This is not the case for the first members of the homologous series of alcohols, but it holds from the C_4-alcohols upwards. Moreover, consideration of the aldol reactions reveals the fact that the conditions employed in the modified methanol synthesis can hardly be those best suited to the production of higher alcohols etc. since they aim principally at hydrogenation. It follows that the modified methanol synthesis is probably not the best method for producing high alcohols, and we have been led to consider the possibilities of a multistage process based on the reactions indicated by the aldol theory.

The aldol condensation is applicable to aldehydes and ketones, and to mixtures of aldehydes and ketones, so that it may be generalized as follows :

$$\mathrm{{R \atop R'}{>}CO + {R''CH_2 \atop R'''}{>}CO \rightarrow {R \atop R'}{>}C(OH){\cdot}CHR''{\cdot}COR''' \rightarrow {R \atop R'}{>}C = CR''{\cdot}COR'''}$$

where R, R′, R″ and R‴ may be hydrogen atoms, or alkyl, alphyl, or aryl groups. Variation of the initial aldehyde or ketone, or aldehyde and ketone would enable a great diversity of carbon chains to be formed, and hydrogenation of the appropriate intermediates would yield glycols, aldehydes or ketones, and primary or secondary alcohols :

$$\mathrm{{R \atop R'}{>}C(OH){\cdot}CHR''{\cdot}COR'''\ H_2 \longrightarrow CRR'(OH){\cdot}CHR''{\cdot}CH(OH)R'''}$$

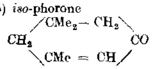
$$\mathrm{{R \atop R'}{>}C{=}CR''{\cdot}COR''' \xrightarrow{H_2} {R \atop R'}{>}CH{\cdot}CHR''{\cdot}COR''' \xrightarrow{H_2} CRR'H{\cdot}CHR''{\cdot}CH(OH){\cdot}R'''}$$

The manufacture of *n*-butyl alcohol at Hull by the Distillers Co. from acetaldehyde via crotonaldehyde :

$$\mathrm{2CH_3{\cdot}CHO \rightarrow MeCH{:}CH{\cdot}CHO \rightarrow Me{\cdot}CH_2{\cdot}CH_2{\cdot}CHO \rightarrow MeCH_2{\cdot}CH_2{\cdot}CH_2{\cdot}OH}$$

and recent proposals to prepare methyl *iso*-butyl ketone and carbinol from acetone via mesityl oxide (B.P. 362,204 ; 362,457) show that these processes are industrially practicable.

This communication is intended to draw attention to the industrial possibilities of the aldol reaction coupled with catalytic hydrogenation, and as examples a number of unsaturated aldehydes and ketones, prepared by aldol condensations from commercially available aldehydes and ketones, have been hydrogenated under pressure in presence of nickel or copper chromite catalysts. The products obtained in each case were as follows :

Aldehydes and ketones	Products
(1) ethylidene acetone $\mathrm{MeCH{:}CH{\cdot}CO{\cdot}Me}$	→ methyl propyl ketone, methyl propyl carbinol
(2) αβ-dimethylacrolein $\mathrm{MeCH{:}CMe{\cdot}CHO}$	→ 2-methylbutanal, 2-methylbutanol
(3) 2-methylpenten-(2)-al(1) $\mathrm{EtCH{:}CMe{\cdot}CHO}$	→ 2-methylpentanal, 2-methylpentanol
(4) 2-ethylhexen-(2)-al(1) $\mathrm{\alpha\text{-}PrCH{:}CEt{\cdot}CHO}$	→ 2-ethylhexanol
(5) *homo*-mesityl oxide $\mathrm{EtMeC = CH{\cdot}COEt}$	→ 3-methylheptanol (5)
(6) *iso*-phorone 	3:3:5-trimethyl*cyclo*-hexanone, 3:3:5-trimethyl*cyclo*-hexanol
(7) A mixture of acetone condensation products	Methyl *iso*-butyl ketone and carbinol. 3 : 3 : 5-trimethyl*cyclo*hexanone and hexanol

Further examples are provided by Sabatier and Mailhe (Ann. Chim., 1909 (8), **16**, 79) and Skita, Ardan, and Kraus (Ber., 1908, **41**, 2939) on the hydrogenation of mesityl oxide and phorone over nickel under atmospheric pressure ; by Darzens (C.r., 1905, **140**, 152) on the catalytic reduction of *iso*butylidene acetone ($\mathrm{Me_2CH{\cdot}CH{:}CH{\cdot}COMe}$) ; and by Adkins and co-workers (J.A.C.S., 1931, **53**, 1091 ; 1932, **54**, 1651) on the pressure-hydrogenation of mesityl oxide and diacetone alcohol [$\mathrm{Me_2C(OH){\cdot}CH_2{\cdot}CO{\cdot}Me}$].

Our experiments indicate that the unsaturated linkage in such compounds is always more easily reduced than the carbonyl group, so that by control of three factors : temperature, pressure, and activity of catalyst, it should be easy to prepare aldehydes and ketones or primary and secondary alcohols at will. For instance, Covert, Connor, and Adkins (J.A.C.S., 1932, **54**, 1658) hydrogenated mesityl oxide to methyl *iso*butyl ketone at 125° under a pressure of 120 atm., and then reduced the ketone to methyl *iso*butyl carbinol by raising the temperature to 150°. With increasing molecular complexity it becomes more difficult to effect reduction of the carbonyl group. Thus catalytic hydrogenation under ordinary or moderate pressure may be effective for the production of aldehydes and ketones, but only partially so for the production of alcohols. Recourse must be made to high pressures in order to obtain alcohols substantially free from the corresponding aldehydes and ketones.

EXPERIMENTAL

Catalysts.—Copper chromite, and copper-barium chromite were obtained by the methods of Adkins and

co-workers (J.A.C.S., 1931, **53**, 1091; 1932, **54**, 1138) whilst nickel-kieselguhr was prepared essentially as described by Covert, Connor, and Adkins (J.A.C.S., 1932, **54**, 1651). The nickel-kieselguhr catalysts were reduced in a current of hydrogen at 400—450°, and were transferred from the furnace into the unsaturated liquid without exposure to air.

Autoclaves.—Autoclaves and stirring gear have already been described by Tongue (Trans. Inst. Chem. Eng., 1930, **8**, 85).

Ethylidene-acetone. —Ethylidene-acetone (100 g.) and nickel-kieselguhr (10 g.) were heated under a pressure of 120 atmospheres.* Absorption commenced at 100° and became very rapid, the temperature rising to 160°. The product consisted of a mixture of methyl propyl ketone and methyl propyl carbinol in the approximate ratio 1 : 2. Further hydrogenation under similar conditions but using copper chromite (5 g.) decreased the ketone content to about 10%. Methyl propyl ketone was identified as 2 : 4-dinitrophenylhydrazone (m.p. 142°, cf. Allen, J.A.C.S., 1930, **52**, 2955) and methyl propyl carbinol as *p-xenylcarbamate*, m.p. 94·5°).

$\alpha\beta$-Dimethylacrolein was obtained by condensation of acetaldehyde and propionaldehyde in presence of caustic potash solution (5%). The aldehyde (25 g.) was heated at 200°† for 6 hours with nickel-kieselguhr (3 g.) under a pressure of 100 atmospheres. The product contained 20% of methylethyl acetaldehyde (m.p. and mixed m.p. of 2 : 4-dinitrophenylhydrazone 119—120·5°) and 80% of *sec.*-butyl carbinol (3-nitrophthalate m.p. 148—151° and mixed m.p. 149—152°).

2-Methylpenten-(2)-al(1), prepared by the method of Döbner and Weissenborn (Ber., 1902, **35**, 1144) was hydrogenated (25 g.) in presence of nickel-kieselguhr (0·5 g.) at 200°† and under a pressure of 80 atmospheres. Absorption was not complete after 12 hours. Of the filtered product 80% distilled between 145° and 150° and consisted of 2-methylpentanol (*p*-xenylcarbamate, m.p. and mixed m.p. 98—99°) whilst the remainder, b.p. 100—145° contained 2-methylpentanal (2 : 4-dinitrophenylhydrazone m.p. and mixed m.p. 103°).

2-Ethylhexen-(2)-al(1), prepared from *n*-butaldehyde by the method of Raupenstrauch (M., 1887, **8**, 112), was hydrogenated (10 g.) in the presence of nickel-kieselguhr (2 g.) at 200°† and under a pressure of 100 atmospheres. After 3½ hours, absorption ceased, and the filtered product was distilled when all passed over between 175° and 185° and consisted of 2-ethylhexanol (*p*-xenylcarbamate, m.p., 79—79·5° and mixed m.p. 80°).

Acetone condensation products.—A quantity of crude acetone condensation products had been obtained in experiments during which acetone was heated to 200° in an autoclave in presence of small amounts of sodium hydroxide solution. This material was dried, and freed from resinous products by vacuum distillation. It was hydrogenated (430 g.) at 150—160° in presence of copper-barium chromite (10 g.) and under a pressure of 120 atmospheres. Hydrogen was rapidly absorbed during 8 hours and more slowly during a further 4 hours. The product, a yellowish-brown oil of menthol-like smell, distilled as follows: 110—125° (11 g.), 125—135° (50 g.), 135—176° (2·5 g.) 85—95°/15 mm. (170 g.), 95—100° (18 g.), 100—115° (10 g.), 115—120° (20 g.), 120—130° (13 g.), 130—140° (12 g.), 140—150° (18 g.) and residue (40 g.). Fraction 85—95°/15 mm. crystallized slowly into colourless needles which after draining on a sintered glass funnel and sublimation melted at 58·5° (Found : C, 75·9; H, 12·9: $C_9H_{18}O$ requires: C, 76·05; H, 12·7%) and possessed the properties of 3 : 5 : 5-trimethyl*cyclo*hexanol, the "dihydro*iso*phorol" of Kerp (Ann., 1896, **290**, 139) and Knoevenagel (Ann., 1897, **297**, 194) although these investigators record lower melting points. Fraction b.p. 125—135° consisted of methyl *iso*butyl carbinol whereas fraction b.p. 100—125° contained the corresponding ketone.

In presence of nickel-kieselguhr the reduction did not proceed beyond the saturated ketone stage and specimens of methyl *iso*butyl ketone (b.p. 115—117°) and 3:5:5-*trimethylcyclohexanone* (b.p. 185—195°) were obtained.

Isophorone, obtained by fractional distillation of the crude acetone condensation product, smoothly hydrogenated to dihydro*iso*phorol under the conditions described above using a copper-barium-chromite catalyst.

Homomesityl oxide (100 g.) prepared by the action of quicklime on methyl ethyl ketone (cf. Organic Syntheses, Vol. 1, p. 45, and Hoffmann, J.A.C.S., 1909, **31**, 722) was dissolved in 100 c.c. of ethyl alcohol and was completely reduced in 6 hours at 175° in presence of copper-barium chromite (5 g.) under a pressure of 120 atmospheres to ethyl β-methylbutyl carbinol, b.p. 165—170°. (Found : C, 73·3; H, 13·8 : $C_8H_{18}O$ requires : C, 73·7; H 13·9%.)

During the course of this investigation the following new derivatives have been prepared for purposes of identification.

p-*Xenylcarbamates*

	M.p.	Found		Theory requires	
		%C	%H	%C	%H
sec. Butyl	105·5	75·9	7·4	75·8	7·1
Methyl propyl carbinyl	94·5	76·4	7·75	76·3	7·5
Methyl*iso*butyl carbinyl ...	95·5	76·65	7·9	76·7	7·8
Di-*iso*-butylcarbinyl	118°	77·8	8·6	77·8	8·6
Dihydro*iso*phoryl	145	78·65	7·8	78·3	8·1

2 : 4-*Dinitrophenylhydrazones*

	M.p.	%C	%H	%C	%H
Ethylidene acetone	155°	50·0	4·6	50·0	4·6
Tiglic aldehyde	206—207	50·2	4·7	50·0	4·6
Methyl ethyl acetaldehyde	120·5	49·65	5·4	49·6	5·3
2-Methylpenten-(2)-al(1)	160—161	52·1	5·2	51·8	5·1
2-Methylpentanal(1)	103	51·5	5·9	51·4	5·8
Di-*iso*butylketone	92	56·0	7·0	55·9	6·9
Dihydro*iso*phorone	145—147	56·6	6·5	56·2	6·3
2-Ethylhexen-(2)-al(1)	124—125	55·0	6·0	54·9	5·9

We thank the Distillers Co. for a gift of ethylidene-acetone.

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* Pressures are initial pressures of hydrogen.
† Temperatures marked with an asterisk were external.

THE INTERNATIONAL STANDARD FOR THE ŒSTRUS-PRODUCING HORMONE

In July of last year a conference was held in London, under the auspices of the Permanent Commission on Biological Standardization of the Health Organization of the League of Nations, with the object of discussing the possibility of securing international agreement on standards of reference and units of activity for the sex hormones. While the conference agreed that knowledge of the male sex hormone, and of the hormones of the corpus luteum and the anterior posterior body, is at present insufficiently advanced to permit of a standard of reference being established, and a unit of activity defined for these substances, important decisions were reached in regard to the œstrus-producing hormone. This hormone has been prepared in pure crystalline form, from the urine of pregnancy, in quantities sufficient to admit of chemical examination; it exists in two forms—a *ketohydroxy form* and a *trihydroxy form*—the first named being the more active, by the ordinary methods of testing, in producing œstrus in animals subjected to oöphorectomy.

The œstrus-producing hormone has been the subject of extensive investigations in recent years, and a state of confusion was developing in consequence of the adoption of different "units." As in the case of other substances exhibiting marked and specific biological activity, attempts to define units in terms of animal reaction had only served to show that units defined on such a basis lacked uniformity: the unit varied, not only from one species of animal to another, but, in the same species, was dependent upon the method of administration and the method chosen for interpreting the result of the administration of the hormone.

The conference agreed that, as in other similar cases, the only safe basis for international agreement on a unit was the adoption of a standard substance, in terms of which the unit could be defined. The standard adopted by the conference for international use is a quantity of the ketohydroxy form of the hormone in pure crystalline condition, which is preserved at the National Institute for Medical Research, London; and the unit of activity is defined as the specific œstrus-producing activity contained in $0 \cdot 1\gamma$ ($= 0 \cdot 0001$ mg.) of this standard preparation.

In order to provide an adequate amount of material to serve as an International Standard, different countries have sent samples of the pure crystalline ketohydroxy form of the œstrus-producing hormone to the National Institute for Medical Research, London (acting for this purpose as the central laboratory on behalf of the Health Organization of the League of Nations) where the final preparation of the standard has been completed, and arrangements have been made for the storage of the standard and for its dispatch to the central laboratories and institutions, in other countries, which have been nominated by the Health Organization of the League of Nations, for local distribution.

Institutions or individual investigators in Great Britain and Ireland requiring the standard for the œstrus-producing hormone should apply to the Department of Biological Standards, the National Institute for

THE ESTIMATION AND DETECTION OF THE HALOGENS

By A. J. MEE, M.A., B.Sc.

The object of this article is to give a review of the work that has been done during the last four or five years on the estimation and detection of the halogens. Where a process is of sufficient importance to warrant it, brief instructions for carrying it out are given, but in most cases it is advisable to consult the original papers (see references below) for full details, since it is not possible here to give more than outlines.

Determination of the halogens when they occur alone.—No new method of outstanding importance has been devised for the determination of the halogens when they occur singly. Heller,[1] in a series of papers extending over the years 1929—1931, has made a study of Gasparini's electrolytic method and its application to both inorganic and organic halides. The chlorine in chlorides, chlorates, perchlorates, and many organic chloro-compounds is best determined by Gasparini's method by using a mixture of 4 volumes of strong sulphuric acid and 1 volume of strong nitric acid as electrode liquid. In the case of chlorates it is necessary to add 1 g. of sodium sulphite to the acidified silver nitrate contained in the absorption bulbs before starting the analysis. Substances which sublime readily do not give good results by this method and some organic bodies cannot be analysed. To determine the chlorine in perchlorates by this method the perchlorate is reduced to chloride by electrolysis in Gasparini's apparatus using a solution of titanic sulphate in concentrated sulphuric acid, together with silver and potassium nitrates as electrolyte. After electrolysing for 5— hours a further quantity of silver nitrate is added followed by ammonia. The solution is filtered and then acidified with nitric acid. The silver chloride precipitated is weighed. An alternative method is to determine the excess of silver in the solution by Volhard's method. The method can also be used for organic substances containing bromine or iodine, provided they do not sublime. The compound is electrolyzed in strong nitric acid to which silver nitrate has been added. Part of the halogen is converted into silver halide, part into halate, and part sublimes as the element. The latter is collected in absorption bulbs. After some time, fo[ur] hours being usually sufficient to complete the electrolysis, the contents of the apparatus are treated with sodium sulphite to convert all halogen into halide, hydrogen peroxide is added to oxidize the excess of sulphite, and the silver halide is filtered off and weighed.

For the determination to a high degree of accura[cy] of chlorides in samples containing only a small quant[ity] (say 5 mg.), Keys[2] recommends a modification of t[he] Volhard method. Only 1—2 c.c. of chloride solution [is] required, and the absolute sensitivity is of the order [of] $0 \cdot 001$ mg. chloride. The method is specially suita[ble] for the determination of chloride in biological liqui[ds]. A valuable literature list is given. Pierce and Cours[...] in a recent paper recommend a modification of Denig[ès'] method, the accuracy of which is $0 \cdot 1\%$. The advant[age] of the method over that of Volhard is that it may [be] used to determine chloride in the presence of many ot[her]

substances which would interfere with the Volhard or Mohr methods, but it cannot be used in the presence of ferricyanide.

In the method proposed by Klein[4] for the determination of the halogen in substances like mercuric iodide, where the usual fusion with caustic soda results in loss of the substance owing to its volatile nature, 0·5 g. of the finely powdered substance is mixed with 20 c.c. water and 1 g. of halogen-free zinc dust. The whole is triturated until no unchanged substance is visible. After about ten minutes the liquid is filtered, and the iodine in the filtrate is determined with N/10 silver nitrate, using potassium chromate as indicator. Lead chloride and silver iodide can be analysed in a similar way, but mercurous chloride does not give good results.

The majority of recent methods are for the determination of one halogen in the presence of the others, or of two or three in a mixture. These will be now described.

Determination of chloride in presence of bromide and iodide.—A method proposed by Longinescu and Badescu[5] in 1927 depends upon the fact that hydrogen peroxide will oxidize bromide and iodide to the respective halogens, but has no effect on the chloride, and that bromine and iodine are readily absorbed by petroleum, whilst hydrochloric acid is not.

1 c.c. of the mixture is treated with 1 c.c. strong sulphuric acid, 2 or 3 drops of hydrogen peroxide, and 1 c.c. of petroleum, and gently warmed. The liquid, which is at first quite dark owing to the separation of bromine and iodine, ultimately loses its colour, which is transferred to the petroleum. On filtering through a moist filter, the aqueous layer is readily separated from the oil. If there is any chloride in the filtrate this will be shown by the usual silver nitrate test.

This is the qualitative test, which works easily and rapidly. The quantitative determination is carried out as follows:—10—15 c.c. of the solution containing the mixture of halides is acidified, and 1 c.c. hydrogen peroxide and 25—40 c.c. petroleum are added. The mixture is warmed gently until there is no coloration in the aqueous layer, when the latter is separated carefully in a separating funnel. The petroleum layer is washed with water, and the washings added to the aqueous layer, in which the chloride is determined by means of silver nitrate by the usual method.

The old method of Field[6] for the estimation of chloride and bromide together by the conversion of silver chloride into bromide is not very accurate and is also a somewhat lengthy process. It has recently been improved by Longinescu and Pirtea.[7]

Using one portion of the mixture, which can be supposed to contain chloride and bromide (though, as will be seen, the method can be applied to other mixtures of halides), the total quantity of halide is estimated by precipitation with silver nitrate. In a second portion the silver chloride and bromide are precipitated and allowed to stand for a short time, after which the supernatant liquid is decanted through a filter and the precipitate washed by decantation until it is free from silver nitrate. 50 c.c. of 7—8% ammonium hydroxide are now added to the precipitate in a beaker, and the mixture is allowed to stand for half an hour, with occasional stirring. This dissolves the silver chloride and part of the bromide. A small excess of potassium bromide solution is now added and the mixture is warmed on the water bath to drive off most of the ammonia. The silver bromide is now precipitated by means of nitric acid, filtered, washed, dried, and weighed. The method of calculation is simple and need not be gone into here.

The method can be applied also to other halide mixtures. In the case of a chloride–iodide mixture the chloride is converted into iodide. In dealing with a bromide–iodide mixture the bromide is converted into iodide, but here it is necessary to use 25% ammonium hydroxide to dissolve the bromide. For a mixture of all three halides the estimation is carried out in three parts. The total silver halide is first precipitated and weighed: the silver chloride is then converted into bromide and the weight of silver bromide and iodide together determined. The chloride and bromide are finally converted into iodide. From the three determinations the amount of each halide present can readily be calculated.

An interesting method for determining hydrochloric acid in presence of hydrobromic acid, that may become practically useful when further investigated, has been devised by Longinescu and Prundeanu.[8] The mixture is distilled with strong sulphuric acid and potassium dichromate, producing chromyl chloride which is oxidized by hydrogen peroxide, to the blue perchromic acid. This is a good qualitative test for chloride in presence of bromide. For the quantitative determination the chromyl chloride is converted into chromium trioxide or barium chromate, or is determined iodometrically, but so far the results obtained are too high.

Bougault and Cattelain[9] have investigated the method of precipitating the mixture of chloride and bromide with silver nitrate, weighing the mixed precipitate, and then reducing it with very pure zinc and dilute sulphuric acid. The precipitated silver is weighed. This method gives accurate results if care is taken to ensure the purity of the zinc; it gives the amount of both chloride and bromide present.

To determine chloride, bromide, and iodide in a mixture, Cousin and Dufour[10] have devised a new method applicable when the amounts of each halide are of the same order. The total halogen is first determined by Volhard's method. In a second sample the iodine and bromine are set free successively by distillation, first with ferric ammonium sulphate and secondly with acetic acid and lead dioxide. A mixture of chlorate, bromate, and iodate can be determined by this method after first reducing by boiling with zinc dust in neutral solution. If only bromate and iodate are present, reduction can be effected by means of sulphur dioxide.

Determination of bromide in presence of chloride.—A method depending upon the oxidation of the bromide to bromine by means of hydrogen peroxide, and absorption of the bromine liberated by magnesium or calcium oxide has been proposed by Longinescu and Pirtea.[11]

Between 20 c.c. and 30 c.c. of the chloride–bromide mixture are placed in a flask provided with a funnel and exit tube fused in the glass stopper. The flask is connected with a wide tube containing magnesium or calcium oxide. If the latter is used it should be previously heated to 600°. A mixture of 10 c.c. strong

sulphuric acid and 1 c.c. 30% hydrogen peroxide is added through the funnel, and the flask heated to 80°, whilst a slow current of air is drawn through the apparatus. The heating is stopped when the contents of the *flask become colourless. The lime is now treated with* 200 c.c. water and 1—2 g. of sodium sulphite to reduce any bromate to bromide. Dilute nitric acid is added and the bromine determined with silver nitrate as usual. It *is possible to determine the chloride that remains in the* flask. The gravimetric method is straightforward, but if the volumetric method is used the hydrogen peroxide must first be removed by boiling with ferrous sulphate, and the solution is then acidified with nitric acid and titrated with silver nitrate.

A method similar to that just described has been used by Bobtelsky and Rosovskaja-Rossienskaja[12] for the *determination of traces of bromide in concentrated* chloride solutions. The bromide is here oxidized by chromic acid–sulphuric acid mixture. For the determination of bromides in the presence of iodides and *chlorides the following method is recommended by* Baitschikov.[13] Fifty c.c. of chloroform are added to 100 c.c. of the mixed halide solution. Sulphuric acid (50 c.c.) is then added, the amount required being *dependent upon the amount of sodium chloride present,* and 0·2% potassium permanganate solution is added until there is a permanent coloration. The mixture is shaken and the chloroform layer separated. The *aqueous layer is twice further extracted with chloroform* and the chloroform extracts are united. The extracts are then shaken with 50% sulphuric acid and sodium sulphite, converting the bromine and chlorine into *bromide and chloride respectively. The process is then* repeated; 15 c.c. of water and 3 c.c. of 2% potassium iodide are then added to the chloroform extracts, and the iodine liberated is titrated with N/100 sodium thiosulphate. The accuracy claimed for the method is 3—4%.

Determination of iodide in the presence of other halides.—Many methods have recently been described *for carrying out this estimation, but by far the most* interesting is that devised by Baines.[14]

It makes use of the fact that when an iodide is added to a mixture of sodium thiosulphate and nitrous acid, free iodine is liberated by the action of the nitrous acid *on the iodide, which then reacts with the thiosulphate.* If the amounts of substances are correctly chosen, there will be an excess of iodine left over after all the thiosulphate has been used up, and this will give a blue colour with starch. The reactions are:

$$2HNO_2 + 2HI = 2H_2O + 2NO + I_2$$
$$I_2 + 2H_2S_2O_3 = 2HI + H_2S_4O_6$$

This is a "time reaction," and a certain period elapses after the addition of the iodide to the nitrous acid—thiosulphate mixture, before the blue colour appears, *the time being dependent on the amount of combined* iodine added. Since the reaction velocity is also effected by the concentrations of the solutions, the degree of acidity, and the temperature, it is necessary always to work under standard conditions for which the reaction has been "calibrated." To prevent the varying action *of bromide, an excess of potassium bromide is alwa*y added.

A standard solution is first prepared containin 20 c.c. N/10 sodium thiosulphate, 60 c.c. N/10 potassiun *nitrite, and 100 c.c. of a 0·5% solution of starch.* Th whole is then diluted to 200 c.c. To 50 c.c. N potassiun bromide solution, 10 c.c. of the standard solution ar added, together with the halide solution to be estimated *and the volume made up to 250 c.c. The mixture i*s placed in the thermostat at 20°, and 10 c.c. of 10% sulphuric acid, previously warmed in the thermostat are added with continuous stirring. Immediately or *mixing the solutions a stop-watch is started, and it i*s stopped when a blue colour appears in the solution. A characteristic curve is drawn, using known quantitie of iodide, and from this the strength of any unknowr solution containing iodide can be determined if th reaction is carried out under the standard conditions.

Other processes have been put forward by Gorbatscheff and Kasatkina,[15] Jean,[16] and Winkler.[17] In the last case the substance containing 2—10 mg. of iodide is dissolved in 10 c.c. water, 1 gm. of potassium bromide is added. and then 2 c.c. of carbon tetrachloride. The liquid is titrated with N/100 potassium bromate until there is no colour in the carbon tetrachloride layer.

The potentiometric method has been investigated by Flatt and Boname,[18] the mixture containing small quantities of iodide in presence of larger amounts of chloride and bromide being titrated with N/10 potassium permanganate. Iodine is liberated, and in hydrochloric acid solution forms iodine monochloride. *Bromine is not liberated until this stage of the reaction* is complete. The potential rise corresponding with the formation of iodine monochloride is observed.

Determination of halogens in organic compounds.—Heller's[19] work on the Gasparini electrolytic method *and its application to the analysis of organic halogen* compounds has already been referred to. The halogen in certain classes of compounds can be accurately determined by means of a benzyl alcoholic solution of potassium hydroxide (Sabetay and Bléger).[24] The method used is to heat 0·1—0·3 g. of the substance for an hour with 40 c.c. benzyl alcohol and 10 g. potassium hydroxide in a pyrex flask with an air condenser attached. After cooling a little, 50 c.c. of water, 30 c.c. of ethyl alcohol, 30 c.c. of nitric acid, and a known excess of N/2 alcoholic silver nitrate solution are added. The excess of silver nitrate is then determined by Volhard's method.

Detection of the halogens.—Some of the reactions used in the determination of the halogens can be used as qualitative tests, and where this is possible, attention has usually been drawn to the fact in the above account.

A method of detecting chloride in presence of bromide, iodide, and the cyanide group is given by Michaltschischin,[20] whilst Montequi and Puncel[21] give a method *for detecting chloride in presence of bromide by a modifi*cation of Berg's method which oxidized bromide by bromic acid in the presence of acetone. 5 c.c. of the mixed halide solution are mixed with 2 c.c. of 7·2 N sulphuric acid and 3 c.c. of acetone. The mixture is heated just to boiling and a 5% solution of potassium bromate in

2N sulphuric acid is added drop by drop. The liquid is then diluted with water to 30 c.c. and 10 drops of strong nitric acid and 2 drops of silver nitrate solution are added. A precipitate indicates presence of chloride.

A specific reaction of iodides is given by Kruisheer.[22] The solution is mixed with an equal volume of strong hydrochloric acid, and then saturated with sulphur dioxide. If a yellow colour appears, which may be extracted with amyl alcohol, iodide is present.

A special reagent is recommended by Montequi and Otero[23] for the detection of chloride in the presence of cyanide. The reagent is prepared by dissolving 4·25 g. silver nitrate and mercuric nitrate (made by dissolving 2·7 g. mercuric oxide in 10 c.c. strong nitric acid) in water, and diluting to 50 c.c. On adding this solution to a dilute solution containing chloride and cyanide ions, non-ionized mercuric cyanide is formed, together with silver chloride. The solution should not contain more than 0·5% alkali cyanide or an insoluble complex may be formed.

Space does not permit of a description being given of new methods of determining the halogen oxy-acids, or of the use of adsorption indicators in the determination of halides and of silver, upon which a good deal of work has been done.

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22 Kruisheer, Z. anal. Chem., 1932, **89**, 196—197; A., 1932, 1009.

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24 Sabetay and Bléger, Bull. Soc. chim., 1930, [iv], **47**, 114—118; A., 1930, 318.

INDUSTRIAL NOTES FROM EGYPT

Adulteration has always been something of a problem in Egypt, and the Public Health Department has already drafted a law to protect the public from adulteration of foodstuffs. It is understood that the law defines as foodstuff any product, solid or liquid, used by man as an aliment, with the exception of drinking water and medicines. All substances which enter into the composition of aliments, such as sweets, spices, etc. are to be considered foodstuffs. Foodstuffs bearing trade marks will not be allowed to be made or sold without special authorization, and the export of foodstuffs not in accordance with the stipulations of the law will not be allowed. The competent authorities reserve the right to take samples either for examination or analysis before they are imported. The draft law provides for fines and for sentences of imprisonment in cases of infraction up to one year in length.

Adulteration of locally manufactured soap was discussed recently by the Consultative Council of the Department of Commerce and Industry, and it was decided that the Department should be asked to investigate and report upon the industry as established in the country. Large quantities of soap are made, chiefly of household quality, but small amounts of toilet soap are made also. Cotton seed oil is mostly used, though considerable amounts of olive oil are imported from Greece, Syria, and Palestine. There is no dearth of caustic soda of local manufacture, and the chief centres of the industry are Cairo, Alexandria, Tanta, Kafr ez-Zayyât, and Zagazig. The suggestion has been made that the Department should set up its own factory for the extraction of oils, and an expert was sent to Germany to study the question there. On his return he made a report, but there is some doubt whether the factory will be set up. There have been many complaints of the rise in price of cottonseed oil, which is an important foodstuff in the country, and the Department is fully occupied in dealing with these for the time being.

At various places in the desert there grows a plant well known to the Bedouin for its medicinal properties. They have a special process of preparing it in order to conserve these, and the secret is handed down from generation to generation. Certain European countries import this plant, dried, for the making of pharmaceutical products, and the suggestion has been made that some further use is possible and that the supply should be advertised. To this end samples have been sent to Europe for analysis for comparison with the results of local analysis.

Several months ago the Department of Mines sent out an exploring party down the coast of the Red Sea to prospect for gold, and in particular a mine known as El Soukkari, which lies some 125 miles from Kosseir, the port from which phosphate is exported to Italy and Japan. The party met with success, and its leader brought back to Cairo a number of samples of ore with which to experiment, with the object of estimating the cost of extraction. Considerable quantities of gold were obtained in Egypt centuries ago, and even quite recently prospectors were at work on their own account in the gold area between Kena and Kosseir.

The Plant Protection Section of the Ministry of Agriculture recently proposed to produce nicotine in Egypt for the preparation of plant sprays and insecticides generally, it having been necessary hitherto to import requirements, a costly proceeding. The Section proposed that suitable plants should be grown on certain limited areas of sandy ground, and it was anticipated that the expense would be small. The Customs Administration vetoed the proposal on the ground that it might encourage the clandestine cultivation of tobacco, and it suggested that the Section should use tobacco waste from local factories which amounts to as much as 236,000 kilos a year. Unfortunately this waste contains very little nicotine, and consequently the Ministry is adhering to its point. The importation of tobacco is an important factor in Egyptian commerce, as the lack of native-grown material makes it necessary to import the whole requirements of the country. Up to 1915 Greek tobaccos occupied the principal place on the local market, but with the introduction of Chinese, Japanese, and Russian tobaccos, and the increase in the importation of Bulgarian and Turkish leaf, the market for the Greek tobacco fell off. The cheapness of the Far Eastern tobaccos gives them a great advantage in the Egyptian market. In 1931 Egypt imported over 5000 tons of tobacco in leaf form for the making of cigarettes to the value of £E.773,891. Of this weight one-fifth came from Turkey, one-quarter from Greece, a little less than one-fifth from Japan, and about one-quarter from China and Bulgaria together. The United States sent only 250 tons, and Russia only 66 tons.

It has been and is still the custom to store grain and cereals in the open in great heaps inside walls, the places thus enclosed being known as *shoonahs*. Naturally this is only possible in a country where the rainfall is so small as in Egypt, but even so the grain suffers deterioration, and recently stocks belonging to one of the big banks were found to have deteriorated to such an extent that it has been decided to build silos. For rice it is proposed to copy those erected in Italy which are considered as most suitable, bearing in mind that the climate of Italy is not unlike that of Egypt.

PROF. C. G. BARKLA.

Charles Glover Barkla was born in 1877 at Widnes, where his father was secretary to the Atlas Chemical Company. He was educated at the Institute in Liverpool and afterwards at University College, Liverpool, where he studied in particular mathematics and physics. In 1899, as an 1851 Exhibition scholar, he proceeded to Trinity College, Cambridge, and worked in the laboratory of Prof. J. J. Thomson. After eighteen months at Trinity he entered King's and joined the College Chapel Choir and entered fully into the musical life of the University. At the Cavendish Laboratory and afterwards at the University of Liverpool he worked on Röntgen radiation and in the years 1905—6—7 made the very important discovery that when X-rays impinge on an element a secondary set of X-rays is emitted, characteristic of the particular element, and having definite wave lengths that can be measured. He showed in 1909 that many of the elements emitted secondary X-rays belonging to two distinct series, the K series and the L series. This discovery has, as is well known, contributed greatly to our knowledge of the structure of the atom. In 1905 he was appointed assistant lecturer in Physics at Liverpool and in 1907 a lectureship in Advanced Electricity was created for him there in recognition of the value of his original work. In 1909 he was appointed to the chair of Physics at King's College, London, and in 1913 to the chair of Natural Philosophy at Edinburgh, where he still carries on research, including his interesting work on the J-phenomenon. He was made a F.R.S. in 1912 and in 1918 was awarded the Nobel Prize in Physics.

He married in 1907 the elder daughter of Mr. J. T. Cowell of Douglas, Isle of Man.

The J-phenomenon upon which he has done so much work seems to break away from all previous theories of the action of radiation upon matter. Instead of the usual conception of action by quanta or harmonic constituents of a radiation, the phenomena observed show in many ways that it is the whole atmosphere of radiation which is effective and that the critical factor is not frequency of radiation but an average quantity more closely allied to temperature of radiation. Alternative but quite different results of the action of X-rays upon matter depend too upon some state of the matter exposed to that radiation. These conclusions have been established as far as the J-phenomenon is concerned and it is possible that they will alter the whole conception of the action of radiation upon matter.

CANADIAN MINING

Cement production in Canada during 1932 declined to 4,555,261 barrels worth $6,997,000 from 10,161,658 barrels valued at $15,826,243 in the previous year. Clay products were down in value from $7,841,288 to $4,093,000; lime from $2,764,415 to $2,199,000, and stone and sand and gravel from $17,726,349 to $9,500,000.

SOCIETY OF CHEMICAL INDUSTRY

OFFICIAL NOTICES

Annual General Meeting. Notice is hereby given that the Annual General Meeting of the Society will be held in the King's Hall, Armstrong College, Newcastle-on-Tyne, at 10.45 a.m., on Tuesday, July 11, 1933.

Business

(1) Minutes of Fifty-first Annual General Meeting, 1932.

(2) Election of Officials :

President

Four Vice-Presidents

Four Ordinary Members of Council (there will be no ballot).

(3) To receive, and if approved, to adopt the Annual Report of Council.

(4) To receive, and if approved, to adopt the Honorary Treasurer's Report and Statement of Accounts, Balance Sheets, and Auditors' Report thereon.

(5) Election of Auditors.

(6) Votes of thanks to officers and others.

(7) President's Address.

Annual Meeting, 1933. Members are strongly advised, in order to avoid disappointment, to make application both for hotel accommodation and the various reservations in the programme, with the least possible delay.

In the event of application forms having been mislaid, further copies can be obtained on application direct to the General Secretary, 46, Finsbury Square, London, E.C.2. Other communications should of course be addressed to the Hon. Secretary, Mr. J. W. Craggs, 4, St. Nicholas Buildings, Newcastle-on-Tyne.

Works Visits. Although the stipulation is not mentioned in the programme, it is generally understood that members will not apply to visit works conducting a manufacture similar to that in which they are themselves interested.

Hotel Accommodation. Owing to other events arranged simultaneously in Newcastle, it has not been possible for the Society to reserve a large block of rooms in any one hotel. There is therefore no official hotel in the ordinary sense of the word, and it will save a great deal of trouble if members will avoid making inquiries on that point. It would perhaps be wise to indicate (1, 2, 3) the order of preference in selecting hotel or hostel. New Hall, Benton, is strongly recommended.

MEMBERS ELECTED

June 16, 1933

Adlington, G. Stuart, 34, Carlton Road, Putney Hill, S.W.15. Research Chemist.

Allpress, Charles Frederick, Carus Park, Lancaster. Chemist.

Campbell, John, 109, Upland Road, East Dulwich, S.E.22. Biochemist.

Davidson, Alexander Linton, Food & Drug Laboratories, John Street, New Edinburgh, Ottawa, Canada. Dominion Analyst.

Dixon, William, Wallace & Tiernan, Ltd., Power Road, Gunnersbury, W.4. Chemist.

Dodd, Arthur, Bromboro Park Works, New Ferry, near Birkenhead. Works Manager.

Hulton, Henry Robert Blethyn, "Jathyn," Artarmon Road, Artarmon, Sydney, N.S.W. Industrial Chemist.

Lawson, Neil, Gripoly Mills, Cardiff. Works Manager.

Smith, Edgar Charles, Low Temperature Research Station, Downing Street, Cambridge. Research Assistant, Food Investigation Board.

Stephenson, George Edward, 135, West View, Newcastle-on-Tyne. Research Chemist.

Turnbull, Robert H., c/o Messrs. J. & R. Hutchison, Ltd., Post Box No. 2280, Calcutta.

White, Richard Frederick, c/o Midland Counties Dairy, Ltd., Corporation Street, Birmingham. Company Director.

OTTAWA SECTION

The annual meeting of the Ottawa Section took the form of a garden party held at the Central Experimental Farm, Ottawa, on the afternoon of June 1. Tea was served on the lawn by a committee of ladies under the convenership of Miss S. N. Hamilton, by kind permission of the Director, Dr. E. S. Archibald. Weather conditions were ideal and the flowers and shrubs were at their best.

Following tea a business meeting was held in the marquee with Mr. R. E. Gilmore in the chair. Dr. Shutt welcomed the guests and urged them to see all the beauties of a place that 40 years ago was a wilderness. The Queen's Prize of $25.00 was awarded to Mr. J. B. Chalmers for his essay on silica gels, and the Ecole Technique de Hull prize was awarded to M. Theo. Bedard. The following officers were elected for the ensuing year :

Chairman : Dr. G. Stafford Whitby ; *Secretary-Treasurer :* Mr. A. Linton Davidson ; *Asst. Secretary :* Mr. A. S. Vince ; *Executive Committee :* Miss F. M. Burt, Prof. E. N. Gougeon, Dr. C. Greaves, Mr. A. A. Swinnerton, Dr. C. J. Watson, and Dr. L. F. Goodwin (Kingston representative) ; *Hon. Auditors :* Messrs. J. W. Davy and J. E. Gooddie ; *Trustee, Queen's Prize Bond :* Dr. A. E. Macintyre.

Dr. Whitby moved a vote of thanks to the retiring officers and Mr. R. D. Whitmore expressed the gratitude of the meeting to those whose efforts had made it such a signal success.

PRIESTLEY COMMEMORATION BY THE FRENCH CHEMICAL SOCIETY

Having decided to commemorate the bicentenary of the birth of Priestley at their annual meeting, the Council of the Société Chimique de France extended invitations to Sir William Pope, Prof. H. E. Armstrong, and Prof. G. T. Morgan, the last of these in his capacity as president of the Chemical Society.

At the opening meeting of this Conference on Thursday, June 15, the chair was taken by Sir William Pope, F.R.S., when the president, Prof. Camille Matignon, delivered an address on "Priestley and His Scientific Work." This address was illustrated by lantern slides some of which were supplied by Dr. J. Newton Friend, and by an exhibition of Priestley relics, of which certain items had been collected and forwarded by Mr. S. E. Carr, assistant secretary of the Chemical Society.

On the following days lectures were delivered by Prof. J. Böeseken of Delft on "The Configuration of Polyhydric alcohols Deduced from their Influence on the Conductivity of Boric Acid," and by Prof. E. Späth of Vienna on "Recent Syntheses of Alkaloids."

On Saturday morning the English visitors were conducted round the new inorganic laboratories of the Collège de France by Prof. Matignon and Dr. Henri Moureu, where they were shown modern equipment for conducting researches at high temperatures under high pressures and *in vacuo*. Although this installation s not yet completed, many interesting researches in norganic chemistry are already in progress. Subsequently the visitors inspected the house in which Le Bel had lived and made his memorable experiments. This Maison Le Bel, which is now administered by the Société chimique, is equipped for the study of stereochemistry especially with respect to the element nitrogen. The Director, M. Paul Freundler, presented commemorative Le Bel medals to each of the British delegates and obtained their signatures to the parchment roll of distinguished visitors.

The annual meeting terminated on June 17 with a banquet which was attended by the Austrian Ambassador, y representatives of the British and Dutch Legations nd by one of Priestley's descendants, a prominent 'rench engineer. The thanks of the British delegation or the generous private and official hospitality extended o them during their stay in Paris, and their appreciation f the French commemoration of the Priestley bicentenry were expressed by Prof. Morgan in the following erms :

'otre Excellence, M. le Président, Mesdames et Messieurs,

Ayant apporté les bons souhaits et les salutations ordiales de la Société Mère à sa fille géniale la Société himique de France je voudrais ajouter que les "Fellows" e la Société chimique de Londres apprécient très ivement le charmant compliment qui a été adressé la chimie anglaise par le Conseil de la Société chimique uand il a décidé de commémorer au cours de son ssemblée annuelle le deuxième centenaire de la naisance de Priestley. Au nom du Conseil et des membres e la Chemical Society je désire remercier tous vos embres de cette manifestation spontanée de fraternité : de courtoisie internationale.

Votre choix de Priestley comme un savant anglais gne de commémoration dans une assemblée française t fondé sur certaines qualités personnelles et scientiques dont le souvenir est peut-être plus vivant en France i en Angleterre où l'on se rappelle moins les incidents storiques.

Comme chimiste, Priestley fut le rival de votre lèbre Lavoisier dans la découverte de l'oxygène. n'est pas dans mon intention ce soir de rouvrir une eille controverse à ce sujet. Etant votre hôte toute usion viendrait mal à propos et serait de mauvais ût.

Il y a eu plusieurs savants pour qui on a revendiqué onneur de la découverte de l'oxygène. Parmi ces 'aux, Priestley en Angleterre et Scheele en Suède aient beaucoup de titres. Quand même on peut bien itenir sans pouvoir être contredit que Lavoisier sut mieux tirer parti de la grande découverte que tous ses rivaux. Il en a fait la fondation de la chimie moderne. Son succès fut si complet que plus tard Adolphe Wurtz commença son Dictionnaire de chimie par les mots suivants : "La chimie est une science française. Elle fut constituée par Lavoisier d'immortelle mémoire."

Les deux savants, Lavoisier et Priestley, se rencontrèrent ici à Paris où Priestley fut reçu très amicalement par Lavoisier et ses collègues. Leurs conférences donnèrent lieu à plusieurs découvertes qui ont fait avancer la chimie nouvelle.

Malgré ses œuvres scientifiques et sa profession de pasteur, Priestley s'intéressait beaucoup à la politique et comme plusieurs autres anglais de son temps qui avaient des opinions politiques très avancées ses sympathies étaient pour la révolution française. Deux ans après la prise de la Bastille, le 14 juillet 1791, une foule furieuse, hurlant comme cri de guerre, "Pour l'église et pour le roi" brûla sa maison à Birmingham avec sa bibliothèque et tous ses appareils scientifiques. Peu après, en 1794, quand la Convention nationale se constitua, Priestley reçut de plusieurs départements français des invitations de devenir un membre de cette assemblée. Après avoir mûrement réfléchi il s'excusa sous le prétexte qu'il ne parlait pas très bien la langue française et cette décision fit qu'il ne put être le citoyen Priestley. Quand même il fut dénoncé par Edmund Burke dans la Chambre des députés anglaise, celui-ci admettant que Priestley avait accepté l'invitation française à cause de son hostilité déclarée contre la constitution britannique.

A cette époque Priestley fut tellement calomnié par ses adversaires politiques qu'à la fin il prit le parti de se réfugier aux Etats Unis et il quitta l'Angleterre en 1794. Le voyage de Londres à New York dura près de deux mois et pendant ce temps son grand protagoniste, Lavoisier, subit un sort encore plus tragique le 8 mai de la même année

Lavoisier et Priestley furent, tous les deux, victimes de persécution politique, l'un de la gauche et l'autre de la droite. Dans les temps révolutionnaires il n'y a guère à choisir entre une faction et une autre. On ne peut même pas dire que les savants sont aujourd'hui exempts de ces malheurs.

Il est bien plus agréable de se rappeler que Priestley fut membre de l'ancienne Académie des Sciences, honneur qu'il dut à sa correspondance amicale avec ses contemporains français dont il connut personnellement plusieurs. Les manifestations auxquelles vous avez invité notre doyen Professor Armstrong, Sir William Pope, et moi nous donnent une occasion favorable de suivre le bon exemple de Priestley.

Maintenant j'ai à vous annoncer quelque chose, qui, je l'espère sera agréable à tous les convives. A la réunion du Conseil de la Chemical Society qui s'est tenue jeudi soir, avant mon départ de Londres, deux propositions ont été faites pour notre liste de membres honoraires, la première s'adressant à votre Président, M. Matignon et la seconde à M. le Professeur Béhal.

Il faut que je vous explique que ces collègues estimés sont proposés mais pas encore élus. Les elections auront lieu en octobre et au commencement de novembre.

En attendant il fait espérer que son Excellence, l'Ambassadeur britannique, et les autres hommes d'état des deux côtés de la Manche pourront conserver la paix entre les deux ennemis héréditaires, au moins jusqu'à l'automne. Si cela leur est possible il est certain qu'avant la fin de l'année Messieurs Matignon et Béhal seront admis parmi nos membres honoraires.

Il ne me reste maintenant qu'à vous exprimer nos remerciements les plus chaleureux de votre hospitalité si cordiale et de votre accueil si amical. Permettez-moi d'y ajouter mes meilleurs vœux pour la prospérité continuelle de la Société chimique de France. Je lève mon verre en l'honneur de la Société chimique et de son digne Président.

CORRESPONDENCE

ALCOHOL THROUGH THE AGES

SIR,—With reference to Dr. Patterson's letter (cf. CHEM. & IND., March 31, p. 292), I find belated confirmation of the contention tbat "alcohol of sulphur" originally implied carbon bisulphide, and not flowers of sulphur. On page 210 of "A Treatise on Chemistry," by M. Donovan (a volume of "The Cabinet of Natural Philosophy," conducted by the Rev. Dionysius Lardner, London, 1832) occurs the statement—"Sulphur combines witb carhon and forms a liquid which formerly had the absurd name of alcohol of sulphur, but is now called bisulphuret of carbon."

I am, Sir, etc.,

N. J. L. MEGSON

Chemical Research Laboratory
Teddington
June 16, 1933

PERSONAL AND OTHER ITEMS

Sir William Hardy, F.R.S., will be the special visitor at the annual Assembly of Faculties of the University of London at University College on July 6.

The University of Cambridge has appointed Mr. H. E. Woodman and Mr. H. H. Nicholson lecturers in agricultural chemistry at Downing and Selwyn Colleges, respectively. Mr. G. D. H. Bell, Selwyn, has been appointed university demonstrator in agricultural biology.

At the annual dinner of the Society of Dyers and Colourists, held recently, Dr. W. H. Moberley received the Society's Gold Medal on behalf of Prof. W. M. Gardener, who recently retired from the position of editor of the Society's Journal after 32 years' service. Mr. Thorp Whitaker was elected president of the Society in succession to Mr. Lennox B. Lee.

Prof. Michael Polanyi has accepted an invitation to a chair of physical chemistry in the University of Manchester and will commence his duties at the beginning of the 1933-34 session.

Mr. William B. Bell, president of the American Cyanamid Co., has been elected president of the Manufacturing Chemists' Association of America in succession to Mr. Lammot du Pont.

Dr. J. F. Baker, technical officer of the Steel Structures Committee, has accepted an invitation to the Chair of Civil Engineering in Bristol University. The chair becomes vacant at the end of the current session by the resignation of Prof. A. J. S. Pippard.

Dr. C. L. Butler has been appointed senior Fellow in pure research in the research department in pure chemistry of the Mellon Institute, Pittsburgh. Dr. Butler was appointed to a Fellowship at the Mellon Institute in 1928, and since 1929 has also held the post of lecturer in chemistry at the University of Pittsburgh. In the work in progress at present he is applying the principles of stereochemistry to the study of quinine and other cinchona alkaloids in the hope of obtaining new compounds of medicinal value.

We regret to learn of the death in America on May 31 of Prof. W. P. Ryan, head of the department of chemical engineering at the Massachusetts Institute of Technology.

We regret to learn of the death in America of Mr. G. V. Horgan, general manager of the American Paint and Varnish Mannfacturers' Association, and of the National Paint, Oil, and Varnish Association of America. Mr. Horgan was 53 years old and had been prominent in the paint industry in America for nearly 20 years.

Sir Benjamin A. Whitelegge, K.C.B., Chief Inspector of Factories for many years, left estate of the gross value £8354, with net personalty £8228.

Mr. A. A. Thompson, director of British (Non-Ferrous) Mining Corporation and other mining concerns, left personal estate in Great Britain valued at £30,973.

Mr. A. V. Hunt, who was manager of the chemicals department of Lever Bros., Ltd., left estate of the gross value £7279 with net personalty £5915.

University of London

The Court of the University of London has recorded its gratification at the making of grants of £5000 by the Merchant Taylors' Company and £100 by the Stationers' Company, payments of which are to be spread over several years, and which will be applied to meet the cost of the new ceremonial hall of the Bloomsbury buildings.

Institute of Chemistry

A large party consisting of members of the Bristol and South Western Counties of the Institute of Chemistry, visited Dartington Hall Estates on Saturday, June 10. The party included Dr. E. Vanstone (chairman), Mr. E. Russell, Mr. H. F. Barke, Mr. A. Marsden, Dr. B. C. Monkhouse, Mr. E. Lewis, and Mr. A. F. Needs. A number of the departments at Dartington Hall were inspected; these included the Textile, Agricultural, Saw Mills, and Laboratories. Mr. W. H. Slater outlined this unique experiment in rural development which has already achieved considerable success. Dr. E. Vanstone and Mr. E. Russell replied for the visitors. A brief visit was paid to Buckfast Abbey and subsequently a dinner was held at the Courtenay Hotel, Newton Abbot, when Dr. Vanstone presided.

Work on Fuel at Leeds University

The report of Prof. J. W. Cobb, Livesey Professor, on the work of the Department of Coal Gas and Fuel Industries at the University of Leeds records an increase in the number of men proceeding to the University after having had experience in works practice. It is notable that gas engineers and others in responsible positions in the fuel industries are showing an increasing

tendency to send their sons to the University for technical training, whilst it is also becoming recognized that colliery officials, merchants, and salesmen should be more precisely informed of the qualities of coal and its suitability for different uses.

The report contains brief accounts of the research work in progress at Leeds, from which information on many important subjects should become available. Members of the Society will note with interest that Mr. G. A. Thompson, who was awarded the John Gray Jubilee Memorial Scholarship, has been engaged in work under the direction of Mr. H. J. Hodsman on the influence of thiocyanates on the reactivity of cokes made from different raw materials, and it has been claimed that the ignition temperatures of some raw materials can be greatly reduced by this means. For a thesis on this subject he has been awarded the degree of B.Sc. with second class honours.

British Industries Fair

Exhibitors at the British Industries Fair will learn with interest that the King has conferred the decoration of C.V.O. on Mr. Claude Taylor, director of the Fair. Mr. Taylor has been associated with the Fair a secretary since 1915, the year of its inception, and became director in 1932.

The number of exhibitors in the druggists' sundries section of the Fair has already increased from 47 to 59, and the section is therefore entitled to two representatives on the Exhibitors' Advisory Committee. Mr. M. D. Nixon of Solport Bros., Ltd. has been elected as the additional representative.

Non-Ferrous Metals Research

The thirteenth annual report of the British Non-Ferrous Metals Research Association, that has just been issued, forms a very useful guide to the work of the Association during the last year and the many researches at present in hand. Important work has continued in the investigation of the influence of impurities in copper, and progress has been made in the work on the soundness of aluminium castings, factors affecting the galvanizing process, alloys for high-temperature service, etc., whilst the chapter on development progress provides useful information regarding the B.N.F. ternary alloys of lead, the new alloy tellurium lead, and other matters which have aroused interest in the last year. Part of the report is devoted to appreciations of the work of Prof. R. S. Hutton, who resigned from the position of Director of the Association on taking up a professorship at Cambridge at the end of 1932.

Research in Building Materials

Three articles recently published (January—March) in *Buildings and Building Management* together form a useful guide to recent American work on building materials and the trend of modern building practice. The articles are by Mr. H. B. Winslow, of H. H. Robertson Co., Pittsburg, which is the donor of the Mellon Institute's multiple fellowship for research on building materials, and the work of both the Mellon Institute and the U.S. Bureau of Standards is described concisely. Reprints of the articles can be obtained from the Mellon Institute, Pittsburgh.

British Standard Specification for Turbine Oils

A new B.S. Specification for Turbine Oils (No. 489—1933) which has been prepared by a Technical Committee of the Petroleum Industry Committee has now been published by the British Standards Institute. The specification is particularly concise and excellent diagrams of the apparatus employed in testing are incorporated. The appendices deal with the determination of viscosity, flash-point, tendency to sludge, volatility, acid value, demulsification number, total sulphur and deleterious sulphur, and the method of carrying out the cold test is detailed. The specification brings together information previously given in "Directions for the Study of Insulating Oils." (Report Ref. E/S2, British Electrical and Allied Industries Research Association) and "Methods of Testing Petroleum and its Products" (Institution of Petroleum Technologists). Copies can be obtained from the Publications Department, British Standards Institute, 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

Indian Notes

Industry in the Punjab.—Although trade in the Punjab was affected by the general depression, there were signs that industrial development in the province was making progress, according to the report of the Department of Industries, Punjab, for the year ending March 31, 1932. Twenty-one new factories were opened, including a chemical factory at Amritzar. The policy of the local Government is to give every encouragement to industries which appear likely to be successful; amongst the most promising are oil refining, sugar refining, and the manufacture of toilet goods, whilst the utilization of indigenous drugs and lac offers considerable scope. A development which may be productive of important results was the appointment of an industrial chemist in the department. During the year he began an examination of the oilseeds of the province and investigated various methods of refining, deodorizing, and bleaching rapeseed, sesame, coconut and castor oil for edible and other purposes. Formulæ were also worked out in the laboratory for the manufacture of various articles such as inks and boot polishes.

Industry in Mysore.—Several industries are developing satisfactorily in Mysore, one of the most progressive of the Indian States, and 25 industrial installations were erected last year by the Mysore Department of Industries.

An interesting experiment was the erection of a gas plant for generating electric power for *lantana* charcoal, by which it was found possible to generate electric power at a cost of about one anna per B.Th.U. The plant is stated to be well suited for lighting purposes in the rural areas, which are not within the reach of the hydro-electric system. Local labour is being trained for the processes of porcelain manufacture. The main object of this enterprise is the manufacture of insulators and other electrical goods. Attention is also being given to the manufacture of crockery and fancy porcelain goods.

Dyestuffs in Russia

The production of dyestuffs in the U.S.S.R during 1932 totalled 23,788 tons, as compared with 16,287 t. in the previous year. The production of intermediates has also increased in the same period from 23,048 t. to 33,747 t.

REVIEW

Untersuchung der Brennstoffe und ihre rechnerische Auswertung. By Prof. Dr. M. Dolch. Pp. xvi + 236. Halle (Saale): W. Knapp, 1932. Paper, 18.50 rm.; bound, 19.80 rm.

his was one of the last works of the much lamented Dolch, and it may be stated at the outset that it ıld be of considerable use to all concerned with the ıation of fuels and particularly to students of fuel nology. The book is divided into two main parts, first of which deals with the methods of investigation ıed to coal and includes sampling, moisture deterıation by the well-known method of Dolch and Stube, ral constituents and their analysis, and ash fusion es. These are followed by detailed treatment of ıate analysis, coking properties, and analysis of the ıucts of distillation obtained from small scale assay ts. The caloriscope or explosion calorimeter is also ribed. Part two deals more particularly with the ıation of the results of investigation and is subded into nine sections. This part occupies about thirds of the book and is a fund of information. y results from lignites and brown coals are given, other fuels, including "Coalite," receive good treatt. Much useful data on the calorific value of different s from various geological formations in all parts of world is included. The coking index and agglutinatvalue of coal also receives good treatment. Complete fication, including the cracking of tar, is dealt with nsiderable length and a series of heat-balances given ther with analyses of products obtained when workwith various superheater temperatures.

here are 10 graphs, 25 illustrations, and about 100 es, also an excellent index. Altogether it is a very ıl book. A. M.

COMPANY NEWS

UNITED INDIGO & CHEMICAL CO.

ividend on the 5% participating shares has been ared for the six months ended June 30 at the rate %, less tax.

ENGLISH CHINA CLAYS, LTD.

uring 1932 the company became amalgamated with ering China Clays, Ltd., and H. D. Pochin & Co., . and the report for 1932 covers only the first nine ths of the year. Operations resulted in a net of £17,985, against which has been placed £30,000 sferred from contingencies reserve, and £12,862 ıght in from the previous accounts. The directors ose to pay the dividend on the preference shares for year 1931 (which will absorb £20,951) and to carry ard the remaining balance of £3,926. The unprofitresults are said to be due to the demand for china being much less than capacity to supply, the lting keen price competition, and the restriction cilities for export trading.

ALLIANCE ARTIFICIAL SILK, LTD.

is announced that a scheme of capital reorganization been sanctioned by the Court and 300,000 £1 particing preferred ordinary shares will be issued. After nent of 6% these and the ordinary shares will rank lly for further dividend.

MARKET REPORT

There are no changes to report in market prices this week.

PATENT LIST

The following is a list of complete specifications of chemical interest which are open for inspection under Section 91 (4) (a) of the Patent Acts. Printed copies are not available, but photographic copies may be obtained at a charge of 8d. per page (minimum 1s.) from the Patent Office, Chancery Lane, W.C.2.

I. 16,829 (1932). Siebert Ges. Thermocouples.

19,127 (1932). Thorne. Apparatus for separating and recovering solid matter from liquid suspension.

34,114 (1932). Kängro and Lindner. Reaction chambers for treatment of materials.

II. 33,778—9 (1932). Comp. Franç. de Prod. Organo-Chim. Active carbon.

34,479—80 (1932). Comp. Lorraine de Charbons pour l'Electricité. *See* XI.

III. 32,855 (1932). Henkel & Co. Manufacture of sulphuric acid derivatives of fatty esters.

33,409 (1932). Henkel & Co. Manufacture of esters substituted in the acid residue.

33,904 (1932). Mantle Lamp Co. of America. Organic products.

IV. 33,935 (1932). I. G. Farbenind. Manufacture of lakes from basic dyestuffs.

34,177 (1932). Groves. Manufacture of vat-dyestuff preparations.

V. 34,043 (1932). I. G. Farbenind. Improving sheets and films of colloids.

34,390 (1932). Brit. Celanese, Ltd. Production of cellulose derivative materials.

VI. 33,418 (1932). Weerts, jun., and Maximine Soc. Anon. Washing and bleaching of textile materials.

34,007 (1932). Brit. Celanese, Ltd. Improvement of textile materials.

XI. 34,479—80 (1932). Comp. Lorraine de Charbons pour l'Electricité. Electric arc carbons.

XII. 34,444 (1932). Soc. Progil. *See* XV.

XIII. 32,062 (1932). Neuss. Producing plastic masses from carbamide and carbamide derivatives.

33,935 (1932). I. G. Farbenind. *See* IV.

34,043 (1932). I. G. Farbenind. *See* V.

34,191 (1932). Internat. Gen. Electric Co. Methods of varnishing and impregnating.

XV. 34,444 (1932). Soc. Progil. Manufacture of fatty substances for treatment of hides.

XXI. 34,228 (1932). Gaspar. Photographic material.

34,229 (1932). Gaspar. Producing coloured photographic materials.

GENERAL NOTES

Official Trade Intelligence

The Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1, has received the following inquiries for British goods. British firms may obtain further information by applying to the Department and stating the specific number. *Belgium:* Metallurgical products (839); Paints (white pigments, zinc oxide, and lithophone in powder or paste), varnish, linseed oil, and stand oil (841).

Ebonite in Factory Equipment

An interesting example of the use of ebonite has been provided by Redfern's Rubber Works, Ltd., of Hyde, near Manchester, which has recently supplied a hydro-extractor completely covered and lined with the material.

The hydro-extractor was made of copper, and since this metal is not suitable for ebonite covering, it had first to be tinned before the process was carried out. The whole of the cage of the extractor was lined inside and outside with a ⅛-in. layer of ebonite, and as there were more than a thousand ¼-in. holes in the cage, each hole had to be opened out to ⅜ in. to allow ebonite bushes to be inserted.

Imperial Chemical Industries, Ltd.

A publication which should be of considerable interest and usefulness to those engaged in the dyeing industry has been issued by Imperial Chemical Industries, Ltd. with the name "Dyestuffs for Garment Dyers." The handbook sets out in attractive and handy manner the most satisfactory methods of application of dyestuffs to the fabrics employed in garments. In order that the dyer shall not need to carry an extensive range of dyes the examples given utilize only a part of the extensive range of I.C.I. products: by this treatment the handbook gains in being not over-burdened with examples. The first part of the book deals with preliminary treatment of garments, and includes a useful chart to assist in identifying textile fibres. Cleansing, stripping, and the removal of stains is dealt with, and the book then proceeds to give the practical details of dyeing union fabrics (cotton and wool) by the one-bath and two-bath methods. A range of Altex union dyestuffs is illustrated for use with mixtures of cotton, wool, silk, viscose and acetate silk, and the dyeing of single-fibre fabrics is then dealt with. A section which indicates that I.C.I. have all possible requirements of the dyer in mind is that which deals with the application of the water-fast Bedecyl range of colours in the renovation of fabric shoes. The final section outlines the treatment of leather for dyeing, and a number of useful reference tables are added.

A second I.C.I. publication of considerable interest deals with laundry washing processes. The printing of literature of this sort has reached a high level, but we have seldom seen a booklet which has been produced with so much thought for effect. The printing is in excellent type, a woodcut by Robert Gibbings forms a frontispiece, and the cover is a Sundour fabric dyed with the now-famous Caledon Jade Green. Apart from such points of æsthetic interest, the booklet is to be commended for its concise treatment of the conditions and processes of laundry work. The efficient laundryman of to-day is a technician, who chooses his raw materials for their purity and suitability of purpose. Imperial Chemical Industries, Ltd. has a wide experience of the laundryman's problems, and "Laundry Washing Processes" sets out the benefits of this experience in words that are not too technical. It should be of the greatest use in the industry.

PUBLICATIONS RECEIVED

Basic German for Science Students: With Vocabulary and English Translations of the German Passages. By M. L. Barker, M.A., Ph.D. Pp. xi + 164. Cambridge: W. Heffer & Sons, 1933. 6s.

Laundry Washing Processes: With Special Reference to the Use of Alkalies. Pp. 47. London: Imperial Chemical Industries, Ltd.

Man and Metals: A History of Mining in Relat[ion] to the Development of Civilization. By T. Rickard, D.Sc. Vol. I. Pp. xiii + 506. Vol. Pp. v + 507—1068. London: McGraw-Hill Publishi[ng] Co., 1932. 50s. (Two volumes not sold separately.)

Pulverized Fuel—The "Grid" Burner. By T. Hurley, B.Sc. Department of Scientific and Ind[us]trial Research. Fuel Research. Technical Pa[per] No. 36. Pp. vi + 21. London: H.M. Statione[ry] Office, 1933. 6d.

Canadian Limestones for Building Purposes. M. F. Goudge. Canada Department of Mines. Mi[nes] Branch No. 733. Pp. ix + 196. Ottawa: F. Acland, 1933. 30 c.

Directory of British Fine Chemicals Produced [by] Members of the Association of British Chemic[al] Manufacturers, 1933. Pp. 64. London: Associati[on] of British Chemical Manufacturers.

Lead. 2nd ed. Mineral Industry of the British Empi[re] and Foreign Countries. Imperial Institute. Pp. 2[...] London: H.M. Stationery Office, 1933. 4s.

Principles of Fruit Preservation: Jam Making, Ca[n]ning, and Drying. By T. N. Morris, M.A. Seri[es] of Monographs on Applied Chemistry. Vol. 6. Edit[ed] by E. H. Tripp, Ph.D. Pp. xiii + 239. Londo[n] Chapman & Hall, Ltd., 1933. 15s.

Paper: Its History, Sources, and Manufacture. [By] H. A. Maddox. 4th ed. Pitman's Common Commo[di]ties and Industries. Pp. viii + 172. London: S[ir] Isaac Pitman & Sons, Ltd., 1933. 3s.

Organic Chemistry. By F. S. Taylor, Ph.D., M.A., B.Sc. Pp. xii + 587. London: Wm. Heineman[n] Ltd., 1933. 10s. 6d.

Universe of Light. By Sir William Bragg, O.M., K.B.E., D.Sc., F.R.S. Pp. x + 283. London: (Bell & Sons, Ltd., 1933. 12s. 6d.

Water Pollution Research. Summary of Curren[t] Literature. Vol. VI, No. 6. June, 1933. Abstrac[ts] Nos. 644—760. Department of Scientific and Indu[s]trial Research. Pp. 181—216. London: H.M. Stationery Office, 1933. 2s.

Die Alkalichloridelektrolyse in Diaphragmazellen Eine Theoretische und Experimentelle Unte[r]suchung. By G. Angel. Pp. 126. Berlin: Verla[g] Chemie, 1933. 12 m.

Kinetics of Chemical Change in Gaseous System[s]. By C. N. Hinshelwood, M.A., F.R.S. 3rd ed. Pp. [...] + 392. Oxford: Clarendon Press; London: H[.] Milford, Oxford University Press, 1933. 15s.

Stereochemie: Eine Zusammenfassung der Ergeb[nisse], Grundlagen und Probleme. Edited by K[.] Freudenberg. No. 9. Pp. 1277—1377. Leipzig an[d] Vienna: Franz Deuticke, 1933. 10.80 m.

Notes on the Use of Schleichera Trijuga (Kusum) [in] Lac Cultivation. Pruning and Cropping. By [D.] Norris, M.Sc. Bulletin No. 15. Pp. 19. Calcutta: Indian Lac Research Institute, 1933. Rs. 1/4.

Handbuch der Anorganischen Chemie: In Vi[er] Bänden. Edited by Dr. R. Abegg, Dr. Fr. Auerbach and Dr. I. Koppel. Vol. 4. Division 3, Part 2, A No. 2. Die Elemente der achten Gruppe des Periodischen Systems. Part 2. Eisen und Seine Verbindungen. A, No. 2. Edited by Dr. I. Koppel. Pp. xii + 337—558. Leipzig: S. Hirzel, 1933. 21 m.